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Enhancing efficiency and performance

**Thomas Perry and
Miles Andrews,
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the pivotal role of industrial
heating technologies in the
production of fertilizers.

Industrial heating technologies are integral to numerous sectors, playing a pivotal role in processes related to manufacturing, energy production, chemical processing, and the production of fertilizers. Among the critical applications of these technologies is the heating of processes inside piping systems, tanks, and equipment such as valves, pumps, meters, nozzles, and strainers, etc. Efficient heating of these components is essential for maintaining process temperatures to prevent freezing and ensure processes can flow throughout the manufacturing facility. There are many methods of heating, depending on the temperatures required, environment, and what energy sources are available in each facility.

Process heating in fertilizer facilities

Piping, tanks, and equipment are crucial components of industrial processes that involve the production of fertilizers. Heating these components can often become an afterthought when commissioning a new system. However, the importance of heating many of the chemicals in these processes should not be overlooked, as it can serve several vital purposes and prevent critical issues down the road:



- Temperature maintenance: certain processes require specific temperatures to be maintained. Industrial heating prevents the cooling or freezing of fluids, ensuring that the intended processes flow smoothly in the piping, tanks, and equipment throughout the facility. Chemicals that need to be heated in production include urea, ammonia, and sulfur liquids and vapours. Liquid sulfur, for example, must be maintained in a very narrow temperature band because of its high freeze point of approximately 247°F, but also its upper limit of 321°F, where its viscosity spikes considerably. When it comes to a critical process like liquid sulfur, it is highly recommended to consult with a company who can run thermal calculations to ensure the correct heating technology is being used in each application.

- Viscosity control: some fluids, such as heavy hydrocarbons and other chemicals, exhibit high viscosity at low temperatures. The relationship between viscosity and temperature is inversely proportional for all liquid processes. Heating these substances reduces viscosity, facilitating easier flow through piping, tanks, and equipment.
- Prevention of corrosion: in industries working with corrosive substances, heating can prevent the buildup of corrosive liquids and solids on the inner walls of pipes, tanks, and equipment. For example, sulfur vapour piping and the vapour area of a sulfur tank are two critical areas to heat to prevent sulfur from corroding the containment walls. The prevention of forming solids

in sulfur tanks can also prevent dangerous fires inside of the tank, playing a critical role in maintaining a safe work environment at a facility.

- **Energy efficiency:** when choosing the right heating technology for a specific application, energy availability and efficiency must be considered. For example, if a fertilizer plant already has access to steam, it likely makes sense to tap into this available resource and choose a heating technology that can utilise the benefits of steam. Energy efficiency is important today more than ever to reduce the energy consumption in the facility, and small changes today can make significant impacts for years to come.

Industrial heating technologies

Steam tracing

Steam tracing involves circulating steam through pipes or tubes alongside the main process line, providing indirect heat transfer to the product. It can be utilised in various industries, including the production of fertilizers. This method is commonly used to maintain the desired temperature of liquids flowing through pipes in cold environments. It can also be used for the rapid heating up of a process if heat-up time is critical for that application.

Steam tracing offers uniform heating and prevents heat loss, ensuring consistent process conditions. Aluminium enhancers can be used for even greater efficiency and performance, minimising the number of tracing passes needed and keeping infrastructure costs to a minimum. Steam tracing is normally the most efficient heating source when considering BTU to BTU efficiency. Just like steam tracing, glycol, water, or hot oil can also be used in tracing applications.

Electric heat tracing

Electric heat tracing uses electric heating cables attached to pipes, tanks, and equipment. These cables generate heat when electrical current passes through them. This method can be controllable and efficient, allowing for accurate temperature maintenance.

Electric heat tracing is suitable for both freeze protection and low-temperature process heating in industries such as chemical processing and water treatment.

Fully jacketed heating systems

Fully jacketed tanks, pipes, and equipment feature an outer shell that encases the main process component. The space between the jacket and the component surface is filled with a heating medium, which is often steam or thermal oil. Heat is transferred

conductively from the medium to the product, ensuring gradual and even heating. This technology is commonly used in the pharmaceutical, food and beverage, and chemical industries. Concerns with using a fully jacketed system are cross-contamination of the process and heating medium, as well as infrastructure cost. While expensive, this method is a must for the most rapid heat-up of a process.

Infrared heating

Infrared heating uses electromagnetic radiation to heat surfaces directly without raising the temperature of the surrounding air. This method offers rapid and efficient heating, making it suitable for applications where quick temperature changes are required. Sectors such as plastics processing, automotive manufacturing, and electronics production frequently rely on infrared heating for its speed and effectiveness.

Induction heating

Induction heating relies on electromagnetic induction to heat electrically conductive materials, inducing a current that generates heat. It offers precise control, rapid heating, and is well-suited for localised heating applications. Induction heating finds uses in sectors including metal fabrication, aerospace, and electronics.

Flameless catalytic heating

Flameless catalytic heaters employ a catalyst to promote combustion without the presence of a visible flame. This technology provides uniform heating and stands out for its energy efficiency. Applications span various industries, including remote power generation, heat production in oil and gas operations, and environmental tasks such as soil remediation. A significant advantage of this heating method is its independence from the electrical grid, making it suitable for remote or off-grid locations.

Conclusion

Industrial heating technologies are essential for maintaining the efficiency, safety, and quality of processes involving piping, tanks, and equipment. From steam tracing to flameless catalytic heating, each method offers distinct advantages suited to specific applications. The choice of heating technology depends on factors such as temperature requirements, energy availability, industry regulations, and cost considerations. As industries continue to evolve, efficient heating technologies will remain crucial for enhancing productivity and sustainability across various sectors. **WF**